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Masseeella flueggeae on *Flueggea virosa*, a new record for Pakistan

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Abstract — *Masseeella flueggeae* on *Flueggea virosa* is reported as a new record for Pakistan. This is the first report of the genus *Masseeella* from this country, raising the number of rust genera known from Pakistan to twenty-two.

Key words — *Euphorbiaceae*, macrocyclic rust, Neelum valley

Introduction

Flueggea virosa is a dioecious, multi-stemmed, fast-growing bushy shrub in the *Euphorbiaceae*. It is common in deciduous woodlands and on forest margins, along rivers, and in rocky areas and is widely distributed in Asia, Africa, and Australia. In Pakistan, *it is found in Sindh, the Kaghan Valley, and Kashmir (Stewart 1972).* In the Neelum Valley, Azad Kashmir, this plant was found heavily infected by a rust fungus that belongs to an interesting rust genus, *Masseeella* Dietel.

Masseeella was erected by Dietel (1895) based on *M. capparis* (Cooke) Dietel [as "*capparidis*"] to accommodate a rust on *Flueggea virosa* in India and named after the famous English mycologist G.E. Massee (Cummins & Hiratsuka 2003). This genus is subtropical in distribution and restricted to the warm regions of Asia in the Philippines as well as South Africa. All species of *Masseeella* parasitize members of the family *Euphorbiaceae* and are macrocyclic and autoecious (Thirumalachar 1943, Singh & Singh 1967). *Masseeella flueggeae* on *Flueggea virosa* was described from the Philippines by Sydow & Petrak (1928)

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and has since been reported in Myanmar (Thaung 2005) and South Africa (Doidge 1950). This rust has pycnidia, aecidia, and uredosori that are unknown in the type species of the genus (Sydow & Petrak 1928, Cummins 1937). The present paper reports the occurrence of *Masseeella flueggeae* on *Flueggea virosa* for the first time in Pakistan. In addition, a noteworthy rust, *Pucciniastrum pyrolae* on *Pyrola rotundifolia* subsp. *karakoramica,* is reported here as a new host record in Pakistan.

Materials and methods

Rusted specimens were collected in Azad Kashmir, Neelum Valley, Lawat and northern areas, Fairy Meadows, Pakistan. Freehand sections of infected tissues and spores were mounted in lactophenol and gently heated to a boiling point. The preparations were observed under a NIKON YS 100 microscope. Spores and sori were drawn using a camera lucida (Ernst Leitz Wetzlar, Germany). Spores were measured with an ocular micrometer. At least 25 spores were measured for each spore state. The specimens were deposited in the Herbarium of the Botany Department, University of the Punjab, Lahore (LAH).

Recorded species

Masseeella flueggeae Syd., Ann. Mycol. 26: 424 (1928). Fig. 1

Material examined: Pakistan, Azad Kashmir, Neelum valley, Lawat, on *Flueggea virosa* (Willd.) Voigt (*Euphorbiaceae*), 16 Aug 2009, Abdul Nasir Khalid 130 (LAH 1130).

Spermogonia and aecia unknown. Uredinia amphigenous, forming groups, yellow to yellowish orange, subepidermal, mostly intermixed with telia. Urediniospores ellipsoid to obovoid, hyaline to yellow, 15–19 × 18–27 µm, wall 1.5–2 µm thick, echinulate to verrucose, germ pores obscure. Telia amphigenous, crowded, mostly along veins or margins of leaf, causing malformations, subepidermal, arising in uredosori, becoming erumpent as hair-like columns, orange to yellowish brown or chestnut brown. Teliospores one-celled, sessile with hyphal attachment organs resembling pedicels, up to 34 µm long, ellipsoid to broadly ellipsoid or cylindric to angular, 16–24 × 23–47 µm, embedded in mucilaginous mass, germ pore apical, wall striate, yellowish brown to chestnut brown, 4–6 µm thick at sides and 4–7 µm thick apically.

Pucciniastrum pyrolae Arthur, North Amer. Fl. 7: 108 (1907). Fig. 2

Material examined: Pakistan, Northern Areas of Pakistan, Fairy Meadows, Bial Camp, at 3,036 m a.s.l., On *Pyrola rotundifolia* subsp. *karakoramica* (Křísa) Y.J. Nasir (*Ericaceae*), with II stage, 11 Aug 2007. Najam-ul-Sehar Afshan G07 (LAH NSA 1119).

Spermogonia, aecia, and telia unknown. Uredinia hypophyllous, covered by epidermis, yellowish orange, rounded, minute, in form of group, covered

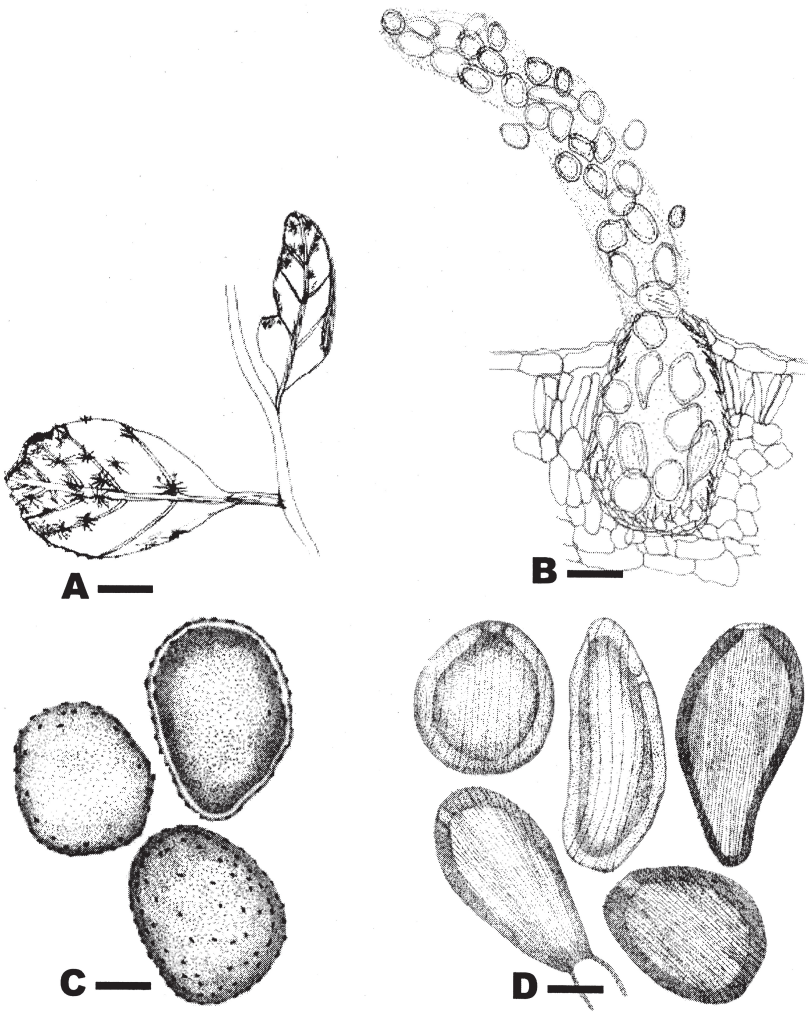

Fig. 1. *Masseeella flueggeae.*
A. Drawing of host plant showing infected parts.
B. A telial sorus showing the development of spore column and mucilage-secreting hyphae.
C. Urediniospores with echinulate to verrucose wall ornamentation.
D. Mature teliospores with striate walls.
Scale bars = 10 μm.

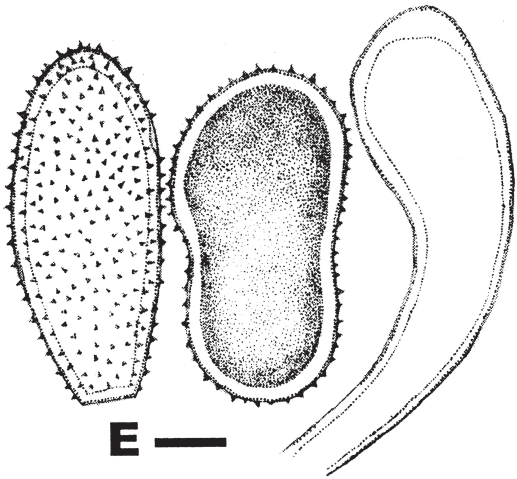

Fig. 2. *Pucciniastrum pyrolae.*
Drawings of mature urediniospores and apex of a paraphysis. Scale bar = 8 μm.

by a peridium of hyphal cells, releasing spores by an ostiolar opening, 0.1–0.2 × 0.2–0.4 mm. Urediniospores ovoid to obovoid or ellipsoid, 13–18 × 26–37 μm (mean = 16.0 × 32.0 μm); wall 1.8–3 μm thick, hyaline to yellow, echinulate; germ pores obscure. Paraphyses clavate, hyaline or yellowish, 13–15 × 47–71 μm.

Pucciniastrum pyrolae has previously been reported on leaves of *Pyrola secunda* L. from Fairy Meadows and Gilgit by Kaneko (1993). *Pyrola rotundifolia* subsp. *karakoramica* is a new host for this rust fungus in Pakistan.

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